

THE MONTHLY NEWS MAGAZINE OF THE NATIONAL BUREAU OF STANDARDS

July 1975

DIMENSIONS

NBS

**Banking
the
Environment**



A PUBLICATION
OF THE UNITED STATES
DEPARTMENT OF
COMMERCE

DIMENSIONS

NBS

July 1975 / Vol. 59, No. 7 / ISSUED MONTHLY

CONTENTS

- 147 Banking the Environment
- 150 NBS Studies Ways to Prevent and Remove Graffiti
- 152 Monitoring Electric Power Networks for Dollar Savings and Quality Control
- 154 NBS Tests Buses, Subway Cars for Fire Safety
- 156 Product Standards for a Summer Afternoon
- 160 Highlights
- 161 Centennial Volume Published
- 162 Equipment, Facilities for Shared Use
- 163 Fire Research Programs Outlined
- 163 Computer Symposium Planned
- 164 New Air Conditioners Save Energy, Money
- 164 Ethane Data Available
- 165 Standard for APT Programming Language
- 167 Publications

Nat. Bur. Stand. (U.S.) DIMENSIONS/NBS
CODEN:DNBSBG 59(7) 145-168

Superintendent of Documents Catalog No. C13.13:59/7
Library of Congress Catalog No. 25-26527



Cover: Scientists with a view to the future plan to collect and preserve samples from today's environment to analyze with the improved measurement techniques of tomorrow. For a full explanation see the story beginning on the opposite page.

U.S. DEPARTMENT OF COMMERCE
Rogers C. B. Morton, Secretary

Betsy Ancker-Johnson
Assistant Secretary
for Science and Technology

NATIONAL BUREAU OF STANDARDS
Ernest Ambler, Acting Director

Prepared by the NBS Office of
Information Activities
Washington, D.C. 20234
William E. Small, Chief

Richard S. Franzen,
Chief, Editorial Section

Sharon A. Washburn,
Managing Editor

Juli Kelley,
Associate Editor

Contributing Editors

L. Kenneth Armstrong,
Kent T. Higgins, Leslie A. Horn,
Madeleine Jacobs, Stanley Lichtenstein,
Frederick P. McGehan, R. David Orr,
Alvin L. Rasmussen, Arthur Schach,
Collier N. Smith, Carol M. Sussman

Visual Editor
Richard E. White



The National Bureau of Standards serves as a focal point in the Federal Government for assuring maximum application of the physical and engineering sciences to the advancement of technology in industry and commerce. For this purpose, the Bureau is organized as follows:

The Institute for Basic Standards
The Institute for Materials Research
The Institute for Applied Technology
The Institute for Computer Sciences and Technology
Center for Radiation Research
Center for Building Technology
Center for Consumer Product Technology
Center for Fire Research

Formerly the TECHNICAL NEWS BULLETIN of the National Bureau of Standards.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Annual subscription: Domestic, \$9.45, foreign, \$11.85, single copy, 80 cents. The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through June 30, 1976.

Banking the Environment

Chemist Sally Harrison transfers water collected with noncontaminating sampling device she developed.



NBS, EPA in collaborative program to establish a National Environmental Specimen Bank

CHEMICALS are an important part of our daily lives. They make up the food we eat, the clothes we wear and, in fact, our bodies. Like many things, however, chemicals have both good and bad effects. Thus, while some chemicals in tiny or "trace" amounts are essential to human life, others can be deadly.

For example, scientists recently discovered that asbestos and vinyl chloride, two chemicals commonly used to make a variety of consumer goods, caused cancer in workers some 20 to 30 years after they were exposed to the substances. And a few months ago, consumers learned that chlorine, which is routinely added to drinking water in many municipalities to kill disease-causing bacteria, apparently reacts with chemical pollutants in the water to form barely detectable, but potentially dangerous, amounts of cancer-causing agents.

These examples are only two of the discoveries made possible in part because scientists have developed

turn page

ENVIRONMENT *continued*

more sensitive, accurate ways of detecting and measuring trace chemicals present in very low concentrations in food, tissues, water and air. Now people are beginning to wonder which of the apparently harmless chemicals in our present day environment might prove to be health hazards.

"Now people are beginning to wonder which . . . chemicals in our present day environment might prove to be health hazards."

Finding an answer to this question is the major reason that the Environmental Protection Agency (EPA), the National Bureau of Standards, the National Science Foundation and the Holifield National Laboratory in Oak Ridge, Tenn. (part of the Energy Research and Development Administration), are studying the feasibility of a National Environmental Specimen Bank (NESB). The goal of this bank would be to sample and store for future analysis a variety of environmental samples from human, animal and plant tissues, sediments, air particulates and water. The availability of such samples would enable scientists to evaluate rapidly at some future date, using new or improved chemical measurement and detection techniques, the levels of unknown or previously unmeasurable chemicals in the environment.

Back in Time

The basic idea of the bank is that from time to time scientists will encounter new chemicals in the environment—new because measurement technology has improved to the point where they can be detected or new because they have shown up in

the environment for the first time. These chemicals may be significant pollutants or health hazards. EPA expects that if the capability exists to select and store certain tissues and other environmental samples, then when these new chemicals are encountered scientists could go back in time and measure their "baseline" concentrations in the stored samples, using the latest analytical methods. By comparing the concentrations of the chemicals in samples taken many years apart, scientists could determine how significant a problem the chemical represents.

"The basic purpose of the bank would be to provide these retrospective capabilities," explains Dr. George M. Goldstein, an EPA research scientist in North Carolina. Goldstein, who is coordinating EPA efforts in the development of the NESB, says that the bank will also serve as an "ecological indicator" or monitoring system, with pollutant trends reflecting the dynamics of specific pollutants in the environment. "This information is essential to detect potentially new health hazards and to assess the effectiveness of pollution control measures," he explains. In addition, Goldstein points out that one of the most significant outcomes of the NESB program would be to provide the scientific community with standardized protocols for sample collection, preparation, storage and analysis for a diversity of elements and chemicals in a variety of ecologically-important materials.

NBS Experience

NBS became involved in the concept of a NESB through the efforts of Dr. Philip D. LaFleur, head of the Analytical Chemistry Division in the

NBS Institute for Materials Research. The division has long been recognized as a leader in the development of analytical techniques for measuring trace substances and has considerable experience in the collection and handling of many different types of materials.

As a first step toward establishing the banking system, NBS is evaluating results of a survey of existing environmental and tissue specimen banks throughout the country that was conducted for EPA by the Holifield National Laboratory. NBS scientists are trying to determine if these existing collections are useful for the determination of trace elements and chemicals and which collections, if any, could potentially provide samples to the NESB.

"... the bank will also serve as an 'ecological indicator' or monitoring system. . . ."

"It probably will turn out that many of the existing specimen banks will not be useful for the bank because the methods of sampling and storing are not acceptable," says NBS chemist Don Becker, who is coordinating NBS efforts in support of the NESB. Becker explains that many specimens in museum collections are preserved with formaldehyde or other chemicals which may destroy or radically disturb substances present in the sample. Other samples probably have been contaminated unwittingly with trace chemicals present on the sampling device itself.

Unwitting Contamination

Sampling is an extremely difficult procedure since in many cases po-

tential contaminants may be introduced in the same or higher concentrations—parts per billion—as the substances which scientists are interested in measuring. In fact, contaminants can be introduced at almost any stage in the sampling, handling, storage and preservation procedure. "One common method of contamination is in containers used to prepare or store samples," Becker points out. "It turns out that each laboratory has its own procedure for cleaning containers. Part of our job in evaluating the survey will be to examine these procedures and recommend the best ones." In fact, NBS will recommend to EPA analytical procedures and protocols for each step of the process—sampling, handling, storage, preservation and, ultimately, analysis.

The NBS Analytical Chemistry Division is well equipped for the job since it has an active division-wide program already underway in trace analysis. For some time, NBS has been involved in the preparation of "ultrapure reagents" and Standard Reference Materials useful in analyzing for trace chemicals. Many sophisticated methods for detecting and measuring trace chemicals have also been developed.

"One common method of contamination is in containers used to prepare or store samples."

For example, one NBS chemist has developed a non-contaminating sampling system for water and another NBS chemist has developed a monitor which can measure extremely low levels of chlorine in water. Other methods undergoing research as analytical methods for trace elements

Samples are frequently prepared for trace metal analysis in NBS "Clean Rooms," where potential contaminants have been minimized.



include neutron activation analysis, isotope dilution mass spectrometry, atomic absorption spectrometry, electrochemical methods, optical emission spectrometry, x-ray fluorescence and specific colorimetric techniques. The trace analysis program at NBS involves studies of the basic elements, as well as inorganic and organic chemicals important in the fields of nutrition, clinical chemistry, the environment, metallurgy and geology.

This extensive experience will be particularly useful once NBS completes its survey analysis later this year. If it turns out that the bank is a feasible project, NBS will assist EPA in establishing it. The NBS project will include evaluating and developing sample handling and storage protocols to maintain trace chemical in-

tegrity and developing and evaluating new methods for determining trace elements. Becker points out that many questions must be answered about the bank, such as how

"... the information gained about trace chemicals and the roles they play will be invaluable."

many and what kinds of samples should be included, which geographical locations the samples should represent and the best ways to preserve large collections. "The existence of this specimen bank will allow us to analyze environmental pollution with hindsight," he says. "However, even if the bank never comes about, the information gained about trace chemicals and the roles they play in human health will be invaluable." □

A bronze statue of a man, likely a firefighter, covered in graffiti and signatures. The statue is wearing a hard hat and has its arms crossed. The graffiti includes names like "Joshua Dinerman", "Steve Feldman", and "Matthew T. Feldman". The background is a solid black color.

In almost any American city, these and other structures are plagued with the words, pictures and obscenities of graffiti. This generally unsightly form of modern art is difficult and costly to remove. The growing graffiti problem is estimated to cost about \$600 million annually.

DIMENSIONS / NBS

Paul Campbell, of the Center for Building Technology, did this work in a recently completed 18-month study for the Department of Housing and Urban Development.

Their study indicates that readily available and moderately priced commercial products remove markings more effectively and cause less damage to building surfaces than some other, more expensive removal methods. For instance, one conventional graffiti removal method—sandblasting—removes a brick wall's veneer and makes the brick more porous, accelerating damage caused by weather and moisture.

Rather than sandblasting, the building engineer can use a commercial paint remover which costs less and leaves the building surface intact. To protect against future abuses, he can coat the building walls with one of the graffiti-resistant substances described in the NBS report.

Commercial Graffiti Removers

In addition to a few products sold as graffiti removers, many products sold as cleaning agents, paint removers, solvents or acids can remove graffiti effectively. Chemically, these products are generally classified as alkaline solutions, organic and mineral acids or organic solvents. They include liquids, emulsions, pastes, gels and powders.

After a preliminary screening which eliminated more than two thirds of the potential graffiti removers, the NBS researchers carefully evaluated 24 products and finally chose five which removed the greatest variety of spray paint markings from brick and other common surfaces. All five products were liquid paint removers.

"These or similar products would

be the most useful for a building maintenance engineer to have on hand," said Godette. He added that spray paint on brick is the most common graffiti problem, but felt-tip pen markings are probably the most difficult to clean up.

However, products other than paint removers are useful in removing graffiti. The study found that some well-known household and industrial cleaners can remove crayon, lipstick and felt-tip pen markings from limestone, ceramic tile, aluminum and other surfaces. "Cleaning agents also work on brick," said Godette, "but the job requires a lot of time and a lot of scrubbing."

The best method for removing spray paint markings from brick, according to the study, is to apply paint remover with a brush, let it stand 5 to 30 minutes and rinse with a high pressure water spray. "You can use an ordinary garden hose if high pressure spray equipment is unavailable," said Godette, "but the results will not be as good. You would have to apply the remover and rinse it several more times, and you still might see traces of graffiti markings."

Performance Criteria

The best graffiti removers identified by the study were those that left the building surface cleanest, as determined by an instrument called a color difference meter. Light-sensitive cells in the color difference meter provide a quantitative measurement of changes in the appearance of the surface. Any product that significantly changed the appearance of unmarked surfaces was judged unacceptable.

Using the color difference meter and other tests, the NBS researchers

developed performance criteria for acceptable removers. A good remover, according to the criteria, must remove a wide range of marking materials effectively without damaging the building surface. The remover should not alter the appearance or nature of the surface material, and it should not spread or drip too much. The volatile solvents present in most removers should not evaporate too rapidly or present a fire hazard.

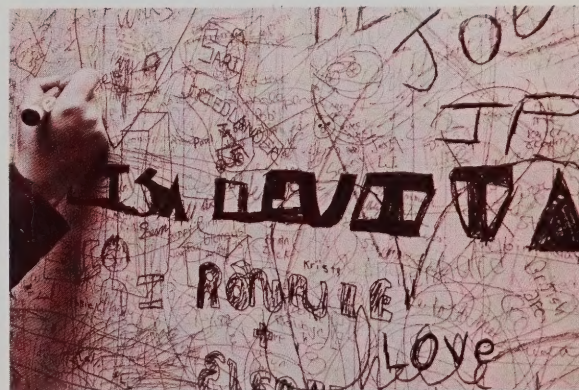
Although the five most versatile paint removers are best for removing a variety of spray paint markings, most of the 24 sample products remove some markings from some surfaces.

Graffiti-Resistant Coatings

Like most diseases, the graffiti problem can be treated with a topical cure alone, or with preventive measures as well. In addition to identifying and evaluating graffiti removers, NBS evaluated building surface coatings that resist markings.

"Graffiti is not easy to remove from a porous surface such as brick, sandstone or limestone," said Godette. "However, if you coat the surface with a substance that resists penetra-

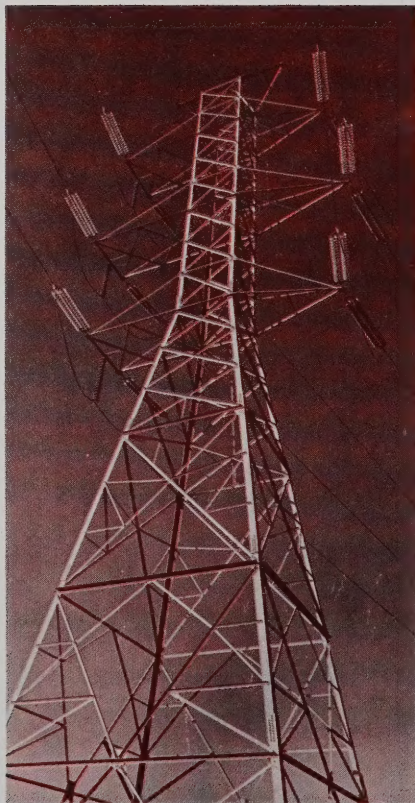
continued on page 165



Monitoring Electric Power Networks

for Dollar Savings and Quality Control

NBS Mobile Lab Checks Measurement Accuracy of Giant Energy Distributing Systems



INACCURACIES of only one-half of one percent in measuring the energy flow over high-voltage power lines can add up to half a million dollars a year in billing errors for the energy transmitted over a single line. In the case of tie lines between networks of different utility companies, such errors would be directly reflected in the payments between companies.

The task of avoiding such costly errors has been made easier by a recently introduced field service of the National Bureau of Standards. Using only three major pieces of apparatus, developed for the purpose and small enough to be comfortably carried in a small van, the NBS High Voltage Measurements Section is now able to calibrate high-voltage standards in the laboratories of electric power companies and on the production test lines of electric power equipment manufacturers.

Special techniques are needed to deal with the high voltages, often several hundred kilovolts (a kilovolt is 1000 volts) and sometimes reaching 1 megavolt (1 million volts), that are used to send electrical energy over long-distance transmission lines and internetwork tie lines.

The small NBS apparatus contrasts strikingly with the huge high-voltage devices it may be called on to check—for example, shunt reactors weighing 90,000 kilograms (100 tons) or capacitors 6 meters (20 feet) high.

Much of the high-voltage equipment is far too unwieldy to be carried to NBS for calibration. The NBS field team is able, however, to bring the calibration service to the equipment, and to do it with an accuracy—approaching full laboratory accuracy—that is more than adequate.

Often the NBS apparatus can sit directly alongside the client's apparatus for testing the same device. It may then be possible to obtain nearly simultaneous measurements from which an evaluation can be made—an evaluation not only of the client's standards, but of his entire measurement system, including the influence of its operators. This happened, for example, when the NBS field system was recently used to calibrate two 500-kilovolt potential transformers on site at a manufacturing plant.

Before looking more closely at what the present NBS apparatus accomplishes and at further equipment under development, we glance briefly at the overall electric power scene into which the field service fits.

Orchestrating Power

It is worth recalling that, despite its important place in the total energy picture, electricity is not, technologically speaking, a source of energy. The importance of electrical energy is due rather to the fact that it is the nearest thing we have to a universal medium of energy exchange.

Other energy forms are readily transformed into electricity, and electricity in turn is easily changed back—into mechanical energy via electric motors, into chemical energy (industrial electrochemical processes, charging of batteries) and into heat and light for homes and factories and wherever humans are sheltered.

Conversion of other forms of energy into electricity in the first place is motivated primarily by the fact that electric power lines are a convenient, clean and fast (practically instantaneous) way to distribute energy from a central source to the point of immediate use. Another

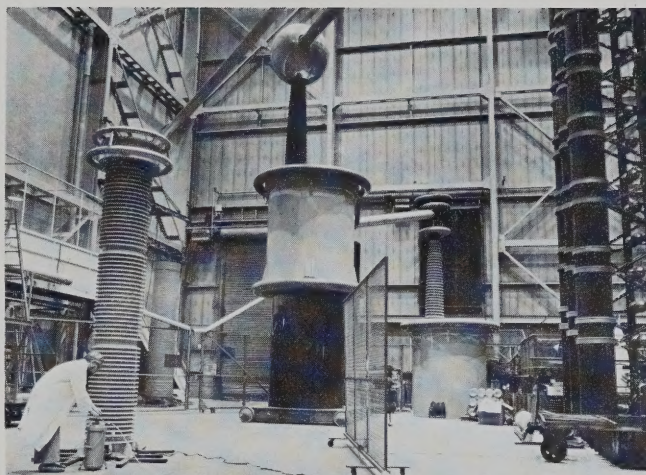
important consideration is the great ease with which energy in electrical form can be controlled and applied to particular purposes.

Hence the vast networks of power lines that reach into all parts of the country. Moreover, the effective size of networks tends to increase as tie lines are inserted—for reasons of economy and as insurance against blackouts—to connect one local or regional network with another.

The minute-to-minute problem facing operators of the electric power system is to orchestrate the output of hundreds of large-scale generators and thousands of substations; to continuously monitor and adjust voltages, currents, power factors and frequency at a great many points in the networks; to direct the energy traffic over tie lines as required by changing local and regional demands; and to protect the system against faults and breakdowns of various kinds.

To do this, large quantities of information are gathered by on-line measuring devices that telemeter their readings to central points where the information is processed (computers are taking over more and more of this) and interpreted and appropriate actions taken.

Accuracy in these measurements is obviously indispensable for reliable and economical operation of the system. Proper adjustment of voltage and power factor, for example, is necessary to keep energy losses—energy wasted in heating the transmission lines—to a minimum. It is also needed in measuring energy for billing purposes to determine the cost to the consumer and the amounts paid by one utility company to another for energy transferred over tie lines.



Small NBS calibration apparatus (left) contrasts with massive high voltage equipment being checked.

NBS Impact

The NBS high-voltage calibrations impact the electric power systems primarily in two areas: (1) the quality control and acceptance testing of the huge, enormously expensive electrical gear — potential transformers and shunt reactors, for example—purchased by utility companies or returned by them to the manufacturer for repairs and (2) energy metering for accuracy in billing customers or other utilities with whom energy is interchanged.

Of major interest in both these areas are measurements of the impedance ratios and associated voltage ratios of transformers and capacitive dividers, the impedances themselves and their dependence on such things as temperature and voltage, and the losses of shunt reactors and capacitors used for power-factor correction. All of these are involved, for example, in calibrating components used in high-voltage energy-flow measurements.

Since it is not feasible, at the high voltages found on transmission lines, to measure electrical energy flow directly with a watt-hour meter, the voltage is first “stepped down” with a potential transformer. Sometimes two or more transformers “in cascade” are needed to bring the voltage down to the operating range (around 100 volts) of available meters. The accuracy of the energy flow measurements will then depend on the accuracy with which one knows the output-to-input voltage ratios of the transformers.

Inductive-type transformers are the most frequently used, basically consisting of a primary (input) coil and a secondary (output) coil wound on a common magnetic core. Increasingly favored is the “coupling capacitor voltage transformer,” a group of high-voltage capacitors in series employed as a voltage divider. If the ends of the chain of capacitors are connected to points between which there is a

continued on page 166

NBS Tests Buses, Subway Cars

for Fire Safety

BEGINNING last December, residents of the Washington, D.C., metropolitan area became increasingly concerned when a series of suspicious fires rapidly destroyed transit buses, most of which were new. A total of four fires consumed five buses (including one old model). In most of these cases, unoccupied buses went up in flames at the end of a run in the evening or while parked in a storage garage. In one case, however, a 13-year-old boy—an apparent runaway—was asleep in the rear portion of a bus that ignited. He was killed.

Even before public pressure built up, the Washington Metropolitan Area Transit Authority (WMATA), which operates the buses, asked the Center for Fire Research at the National Bureau of Standards to under-

take flammability tests of the new buses and their interior furnishings. WMATA had already signed a contract with NBS fire researchers to begin fire-safety studies of cars for the new Washington subway system set to open this fall. It seemed natural for NBS to undertake the bus work as well, and researchers saw it as a valuable opportunity to develop procedures for testing the subway cars.

Public officials were extremely concerned about the fires because the blazes appeared to be acts of arson and because the buses reportedly took a relatively short time to ignite, with extensive damage resulting. John P. Breen, fire marshal for the District of Columbia, even raised the possibility of ordering all 620 of the new buses off the streets until the fire

hazard could be fully assessed.

The rash of fires and the death of the young boy caused considerable news media interest. Local television stations and newspapers gave up-to-the-minute accounts of developments in the Metro bus story.

It was against this backdrop that NBS received one of the new buses from WMATA on March 26. The test bus had been involved in a non-fire-related accident, had sustained severe damage to the front end and was inoperable. It was towed by WMATA to the NBS Fire Research Facility where NBS technicians cut away much of the damaged forward body and created a platform for testing purposes. The rear, undamaged part of the bus was used for the flammability tests.

Bureau researchers, under the



Interior of test bus was instrumented to monitor three full-scale fire tests:

- (1) A trash bag was ignited on a seat.*
- (2) A rolled newspaper was lighted and placed under a seat.*
- (3) 240 milliliters (8 ounces) of lighter fluid was poured on a seat and ignited. The fire tests left the bus interior badly charred.*



direction of Emil Braun, a physicist on the staff of the Center for Fire Research, went to work on the studies. A series of six laboratory tests were performed on samples of the seats, carpeting and other interior materials. Test results demonstrated that the materials met current Federal standards for flammability.

Three full-scale tests were then conducted on the bus. In the first, a trash bag was ignited on a seat—it took 4 minutes for the seating material to ignite. The second test involved a rolled newspaper placed under a seat—it took 2½ minutes for the seat material to ignite. The third and final test involved pouring 240 milliliters (8 ounces) of lighter fluid on a seat. It took just 5 seconds for the seating material to ignite.

In general, NBS found that urethane padding beneath the nylon fabric covering on the seats posed a potential fire problem when ignited. The NBS report to WMATA and Chief Breen states: "The seats are the most probable source of hazard, given an ignition. Once the urethane seat padding catches fire, a serious hazard develops quickly." The initial hazard arose primarily from smoke, although the fire itself was also a threat to occupants, the report noted.

NBS told WMATA that if it wished to protect its buses against arson, it should consider removing the urethane padding, using a highly fire-resistant covering fabric, or placing a barrier beneath the presently used nylon fabric.

To guard against passenger death or injury from accidental ignition, NBS suggested that WMATA compare the time needed to evacuate a bus with the time it takes for a seat to ignite and for the bus to fill with



Flames spill over window frame of test bus 6 1/2 minutes into final fire test—the one involving 240 milliliters of lighter fluid.

smoke. (The full-scale tests showed it took between 1 and 2 minutes for the bus to fill with smoke once the padding had been ignited).

"Clearly, the level of fire safety, in terms of passenger protection, will be improved in any case by removing or protecting the urethane padding," NBS stated.

The report was released at a news briefing on May 15. A WMATA spokesman at the briefing said his agency would consider carefully the NBS suggestions. Chief Breen said Washington-area fire chiefs would study the NBS report before making their recommendations.

Attention in the Center for Fire

Research is now focused on the WMATA subway cars and their interior furnishings. Plans for proposed subway car seats include the use of polyurethane foam, the same synthetic material in the padding of the bus seats.

To test the subway cars for flammability, NBS has constructed a mock-up of part of a car in a large burn room within the Fire Research Facility. The mock-up consists of several rows of seats, windows and wall assembly. Tests similar to those performed on the bus will be conducted on the interior furnishings of the car mock-up. The tests will be completed in August. □



Product Standards for a Summer Afternoon

It's a fine summer week-end. . . . You decide to have a family picnic in the backyard. Your exuberant youngsters burst through the screen door followed by mom and dad carrying food, barbecue supplies and utensils. You toss a few toys on the grass for your youngest, a mere crawler. The others cavort on the swing, slide and jungle gym. You lean against a tree, drinking something refreshing, enjoying the spectacle. . . .

Technical considerations are farthest from your mind—yet a failure in some technical aspect of the products you are using could ruin the picnic. Maybe even worse.

Consider, for example, the portable cooler from which you extracted the bottled drink you're sipping. A few years back, leading manufacturers and National Bureau of Standards engineers came together for a series of special meetings prompted by a finding that coolers with self-locking lids could be death traps for very young children playing hide and go seek.

On the basis of 16 documented suffocation deaths among 1½ to 6

year old children, NBS had called the meetings under the Department of Commerce "Procedures for the Development of Voluntary Product Standards (VPS)." Applying a new provision for government as well as industry initiated VPS action, the Bureau's engineers suggested possible solutions that would feature quick-release lids and snap-out sections or permanent box dividers making interior spaces too small for even the smallest child to get into. These creative re-engineering sessions between company and NBS technicians laid the groundwork for development of a VPS aimed at eliminating dangerous coolers from the market.

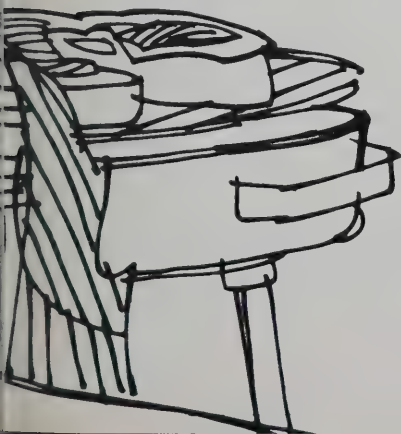
Now, as you finish your drink, consider the bottle that the beverage came in. Its internal pressure strength, thermal shock resistance, abrasion resistance, wall thickness and glass temper are major issues in an ongoing VPS project. According to recent reports by the Consumer Product Safety Commission at least 125,000 people each year are injured by

exploding bottles seriously enough to require medical treatment.

The development of a standard for carbonated soft drink bottles is being jointly sponsored by the Glass Container Manufacturers Institute (GCMI) and the National Soft Drink Association (NSDA). Their action to initiate NBS processing of a proposed standard is typical—industry leaders and trade associations have been invoking the machinery for five and a half decades, ever since voluntary standardization procedures under Commerce Department auspices were first established.

Current VPS procedures call for protection of the public interest by requiring that all concerned—producers, distributors, users or consumers, and groups with a general interest—be represented during the development of a standard. Among the active reviewers of the proposed

turn page



SUMMER *continued*

bottle standard, therefore, are representatives of Good Housekeeping Institute, Consumers Union, the Consumer Product Safety Commission and the Center for Concerned Engineering.

Standards processed through the VPS system are consensus standards. Even though they are not mandatory, they are influential in the marketplace because they help to improve buyer-seller relationships through better and safer product performance and simplified practices. To accept the GCMI/NSDA move for processing the carbonated soft drink bottle standard, the Bureau under VPS procedures first had to determine that the standard would be national in scope, consistent with the public interest, of industry-wide appeal, and would not (or could not) be developed by any private standardizing body.

These criteria met, the draft soft drink bottle standard has been undergoing painstaking analysis and modification by a full complement of experts and with the participation and comments of 400 groups. Promulgation as a VPS is still some distance away because consensus—rigorously defined as a minimum 75 percent approval among the several voting categories averaged together—has not yet been attained. If consensus is achieved and if the NBS Director approves publication of the standard, the soft drink bottle VPS will be officially published. It will also be submitted for listing as an American

National Standard by the American National Standards Institute (ANSI), the nongovernment standards coordinating body. This procedure, now routine for the standards processed through the VPS system, adds new weight and authority to voluntary standards by virtue of this dual listing.

Home playground equipment, unlike soft drink bottles, involves a variety of products—it presents a series of interrelated engineering problems whose collective challenge VPS formulators are confronting. *As your children swing and slide and climb upon your backyard set, think back to the day you toured the local stores and made your selection. Did you have any rule of thumb about how far apart the play units should be spaced? Were you looking for something with a single slide so sized and constructed that it would be suitable and safe for both your youngest and your oldest—or would two slides be better?*

Margaret Dana, syndicated consumer columnist and participant in VPS proceedings, reports keen interest and spirited exchanges on such details at consumer “sounding board” sessions and briefings in many cities. Looking at questions of safety, quality and “the trade-off between space and higher cost,” consumers, she finds, are almost unanimous in saying “let us choose for ourselves but give us warning of possible hazards.”

When the National Association of Children’s Home Playground Manu-

facturers (NACHOP) initiated the development of a voluntary standard for their products (including swings, slides, seesaws and climbing apparatus), injury reports focused attention on: possible tip-over of entire frame while in use; open “S” hooks on swing chains; gliders that might swing too close to ground; weather-exposed bolts, sharp points and protruding edges; and heavy rigid swing seats. According to reports of the National Electronic Injury Surveillance System of the Consumer Product Safety Commission (CPSC), swings and swing sets accounted for about 69 percent of the injuries, slides 14 percent, climbing apparatus 8 percent and seesaws 3 percent during fiscal year 1973.

Having undergone several revisions, the draft standard is continuing through the VPS process. Bearing directly on development of the standard are a number of important contributions from NBS scientists, engineers and psychologists—the latter specializing in analysis of human factors that make for the safe or unsafe, satisfying or unsatisfying, use of products.

Are there, for example, sharp edges or sharp points anywhere in your home playground equipment? The draft VPS uses subjective working definitions—“an edge (or point) that can cut (or puncture) a child’s skin . . . (and that) appears sharp to the casual observer.” Footnotes indicate that the subjective definitions may be superseded by proposed test

methods for sharp edges and points which may be mandated by CPSC. If indeed such action is taken under CPSC mandatory powers, it will be based wholly or in part upon extensive NBS research featuring machines and techniques expressly designed for monitoring and recording the interactions between children and their playground equipment or playthings.

Results of such research are being applied in the development of a VPS initiated by the Toy Manufacturers of America to establish nationally recognized safety requirements for toys. The draft standard has a wide range of provisions covering basic aspects of toy design, materials and construction—for example, the metal edges and wheel clearances on that dump truck your little one is maneuvering in your backyard.

Thirty years ago, a consultant to the Secretary of Commerce predicted that coming decades would bring a rising tide of consumerism and new demands for facts on the performance of consumer products. This trend, he noted prophetically, "will call for more intensive, more skillful cultivation of the whole standards field. . . ."

It is happening, just as predicted. Your backyard family picnic illustrates only a few of the many areas for which new and more comprehensive product standards are in the making. The VPS system is an important element in helping to upgrade the quality of American life by establish-

ing national norms for products as they affect your comfort, safety, health, morale and day-to-day functioning.

Product standards are living documents. They are dynamically conceived and maintained in a full-consensus, representative process that provides for regular updating and modernization of each item as conditions warrant. Democratic political institutions such as the petition, the initiative, the referendum and the recall are paralleled in VPS machinery for project proposals, balloting, and committee review of new and existing standards.

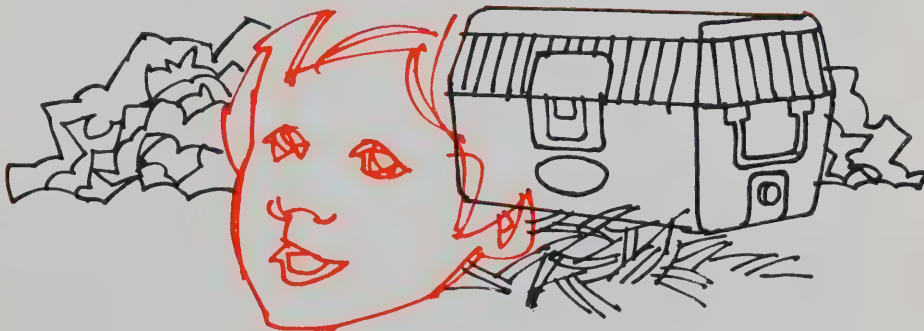
In exceptional circumstances, the Federal Government may initiate a new VPS (as in the case of picnic coolers) or—through a regulatory agency such as the Consumer Product Safety Commission—take action to establish a mandatory standard. In any event, the ultimate intended beneficiaries are you, your family and your neighbors—not only in your capacity as summer afternoon picnickers, but also as citizens of a democracy whose

domestic economy and position in world markets are significantly affected by the quality and efficacy of its product standards.

ODYSSEY OF A VPS

Every voluntary product standard begins as a tentative standard, usually submitted by an initiating trade association or industry group. Assigned to a standard coordinator, the draft standard undergoes an exhaustive series of reviews, circulations for comment, redrafting and reredrafting, balloting and reballoting. After all substantive objections are resolved and a consensus achieved (based on at least 75 percent approval among several voting categories averaged together), the document, with approval by the NBS Director, is promulgated by the Bureau as a Voluntary Product Standard.

For information and assistance related to VPS procedures, contact: Standards Development Services Section, Engineering and Product Standards Division, NBS Washington, D.C. 20234. □



HIGHLIGHTS

Director Leaves for ERDA

Dr. Richard W. Roberts, who served as Director of NBS for 2 years, resigned in late June to accept the position of Assistant Administrator for Nuclear Energy of the Energy Research and Development Administration. Roberts came to NBS in 1973 from the General Electric Company where he served as manager of Materials Science and Engineering. Dr. Ernest Ambler, career NBS physicist and manager, has been Acting Director since Robert's resignation.

Consumer Information

Consumers generally could use more information about the life expectancy of major appliances and the relative costs of their long-term maintenance. NBS is undertaking a major effort designed to develop a methodology for producing such information, called life cycle costing data, which would be useful to consumers in making major purchasing decisions. Appliances selected for the study include water heaters, refrigerators, freezers, room air conditioners, clothes washers and dryers and dishwashers.

Energy Conservation Pamphlets in Spanish

Two popular publications on energy conservation from the National Bureau of Standards are now available in Spanish.

"Energy Efficiency in Room Air Conditioners" (Indice de Eficiencia de la Electricidad en Unidades de Acondicionamiento de Aire, Index Number 082S) provides information to assist consumers in choosing room air conditioners on the basis of energy efficiency and cooling capacity.

"Home Energy Saving Tips from NBS" (Surgerencias de la NBS Para Ahorrar Energia en el Hogar, Index Number 086S) discusses insulation for winter and summer and outlines steps for conserving energy in appliance use.

Single copies of both pamphlets are available at no charge from the Consumer Information Center, Pueblo, Colo. 81009. Consumers should ask for the publication by index number.

Metric Conversion

Information is now available which explains to American manufacturers and engineers the technical details of a computer program package developed to perform conversions between metric and U.S. customary systems of measurement. A brochure prepared for prospective purchasers titled "Computer Program Package for Metric Conversion" can be ordered without charge from: Joseph O. Harrison, Jr., Institute for Computer Sciences and Technology, Technology Building, Room B264, NBS, Washington, D.C. 20234.

Louisiana and Montana Receive Standards

Under the NBS program to provide new sets of weights and measures to the 50 states, Louisiana and Montana were the 43rd and 44th states to receive new standards. On May 28, Harold Wollin, chief of the NBS Office of Weights and Measures, presented the Commissioner of the Louisiana Department of Administration, Charles Roemer II, with a new 95-piece set of weights and measures. The ceremony took place at Louisiana's new Weights and Measures Laboratory in Baton Rouge.

On June 18, Governor Thomas Judge of Montana accepted a new set of weights and measures from Dr. Ernest Ambler, then deputy director of NBS, at a ceremony held in Helena.

New Publication on Nuclear Theory

Pioneering work at NBS in calculation of nuclear structure is reported on in a recent NBS publication, "Relativistic Many-Body Bound Systems." The monograph is devoted to the merger of nuclear and high energy physics and to the formulation of the quantum field theory of nuclei. The main emphasis in this work is on providing the mathematical tools needed to obtain solutions to specific problems in a fully relativistic, consistent manner and up to a known, predetermined accuracy.

Order from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, as SD Catalog No. C13.44:147. The price is \$2.15.

Clinical Standards

More than 20 Standard Reference Materials designed for use in clinical laboratories and available from the National Bureau of Standards are described in a new NBS brochure. Among the standards described are clinical thermometers, glass and liquid filters for spectrophotometry and SRM's for cholesterol, urea, bilirubin and d-glucose.

The brochure, titled "NBS Standard Reference Materials for Clinical Laboratory Measurements," describes the standards and lists their prices. The brochure is available from the Office of Standard Reference Materials, Room B311, Chemistry Building, NBS, Washington, D.C. 20234. □

Centennial Volume Published

A special publication, "The International Bureau of Weights and Measures, 1875-1975," has been issued by the National Bureau of Standards, marking the 100th anniversary of the signing of the Treaty of the Metre which established the International Bureau

The NBS publication is an English translation of the centennial volume that was written, in French, by staff members of the International Bureau and is being published simultaneously in Paris. The work was translated and edited by Dr. Chester H. Page, Coordinator of International Standards Activities at NBS, and Paul Vigoureux, of the National Physical Laboratory of the United Kingdom.

The International Bureau, located in Sevres, France, is a standards laboratory jointly funded and operated by the nations—including the United States—that adhere to the Treaty of the Metre. It maintains the base standards of the metric system, coordinates the measurement standards of member nations and carries on research in metrology, the science of precise physical measurements.

In keeping with the occasion, the centennial volume contains a history of the activities of the International Bureau. It also describes the development of standards and measurement from early times, including the origin of the metric system and its evolution to the present International System of Units.

But the 250-page centennial volume is more than history. The greater part of it (200 pages) is a description, for the nonspecialist, of the construction and use of the standards of measurement in those areas where the International Bureau is most active: mass, length, acceleration due

to gravity, pressure, temperature, electricity, luminous intensity, radioactivity, X- and gamma-rays and neutrons. Dr. J. Terrien, present Director of the International Bureau, notes in his introductory remarks that the publication was designed to be "so easily readable that a large number of readers can absorb the most important aspects of the basic metrology, often ignored, sometimes even by scientists."

In May, ceremonies in Paris celebrating the centennial were held in connection with the meetings there of the General Conference of Weights and Measures and the International Committee for Weights and Measures. The General Conference, which meets at least every 6 years, is the diplomatic body responsible for international agreements on standards and measurement. Its agreements are carried out through the International Committee which oversees the scientific program of the International Bureau.

Dr. Richard W. Roberts, then Director of NBS, headed the U.S. delegation to the General Conference, which also included Dr. Ernest Ambler, then Deputy Director of NBS (also a member of the International Committee); John P. Trevithick, of the State Department's Bureau of International Organization Affairs; William Salmon, Science Counselor of the American Embassy in Paris; and Dr. Donald L. Vieth of NBS, as technical advisor.

Among the centennial events in Paris were a lecture by Terrien, a public symposium and a reception by the President of the French Republic at the Elysee Palace.

Paperback copies of "The International Bureau of Weights and

Measures, 1875-1975" can be purchased in the United States as SD Catalog No. C13.10:420 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. The price is \$3.00 prepaid. □

The basic unit of length, the metre, was once defined in terms of a platinum-iridium metre bar maintained by the International Bureau of Weights and Measures. The metre is now defined in terms of wavelengths of light emitted by Krypton atoms.



Equipment, Facilities for Shared Use

THE National Bureau of Standards has just published a 50-page catalog with detailed information on capabilities and applications of advanced equipment available at its laboratories.

In a foreword to *Special Technical Facilities at the National Bureau of Standards* (NBS Special Publication 413), former NBS Director Dr. Richard W. Roberts points out:

"In many cases our equipment and facilities are unique national re-

sources, ready to play a vital role in solving urgent problems of the day.

"For example, our high flux nuclear reactor is one of the major research reactors in the Nation and is used daily in projects ranging from abstract nuclear theory to analysis of food contaminants."

Twenty-two major equipment categories are covered in the indexed and illustrated catalog, which leads off with accelerators and ends with X-ray facilities. Photographs in the

50-page booklet highlight some of the innumerable applications:

- An NBS transmission electron microscope used in studying the structure of cracks in hard, brittle materials.

- A "hail gun" in the Bureau's accelerated weathering laboratories used to obtain simulated storm damage to building materials and systems.

- Levitation vacuum melting equipment used in the NBS alloy preparation laboratory to produce high-purity materials.

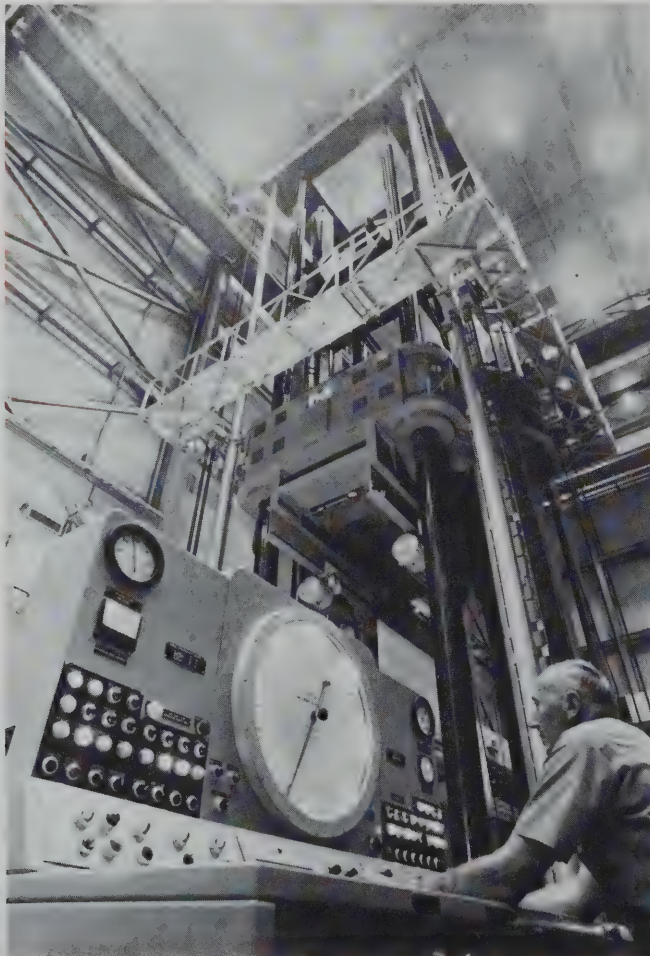
In addition to the Bureau's own staff, users of specialized NBS facilities have included other government agencies, industrial research associates, academic researchers and post-doctoral fellows. Appropriate cooperative use is encouraged, but the Bureau does not accept work that could more effectively be performed elsewhere.

Certain NBS facilities are available for either occasional or extended shared use. Activities funded from outside NBS are required to pay costs intended to recover operating expenses.

The catalog also lists key Bureau contacts for arrangements regarding calibration to U.S. national standards, provision of well-characterized substances, information on evaluated data for physical properties; information on U.S. and foreign documents on voluntary engineering standards and information on automatic data processing equipment and standards.

Order printed copies of NBS Special Publication 413 (price: \$1.10) by SD Catalog No. C13.11:413 from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. □

NBS Universal Testing Machine is designed for use in testing large structural components and in calibrating force measuring devices.



Fire Research Programs Outlined

“...AMERICA’S fire losses are disgraceful and totally unacceptable to a country whose level of technology and human resources is the highest in the world.”

This statement is taken from the preface of a booklet just published by the National Bureau of Standards. The booklet details NBS fire research program. With 12,000 lives lost annually, several hundred thousand persons sustaining burn injuries and \$11 billion in property damages, America has an urgent fire problem.

NBS, with more than five decades of fire-related research behind it, is meeting the challenge of reducing this Nation’s fire losses by 50 percent over the next generation. Renewed impetus was provided by the Federal Fire Prevention and Control Act of 1974 which formally established the Center for Fire Research at NBS.

This latest publication, “Attacking the Fire Problem: A Plan for Action,” outlines the NBS effort in hazard analysis, chemistry, and physics. It also reviews NBS programs for controlling fire in furnishings and building construction and in preventing fire in consumer products. Programs for fire detection and control systems, and for fire safety design concepts are also explained.

Each section contains a statement of program objectives, details current activities in that program area and lists major publications by program scientists and engineers. Appendices provide an organization chart, a list of voluntary standards organizations and NBS representatives on appropriate committees, and a list of fiscal year 1974 accomplishments.

This booklet will be a valuable guide for the fire services, research and enforcement communities. It may

be ordered prepaid for \$1.00 by SD Catalog No. C13.10:416 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Foreign remittances must be in U.S. exchange and include an additional

25 percent of the publication price to cover mailing costs. Order microfiche copies prepaid by NBS designation from the National Technical Information Center, Springfield, Va. 22151; the price is \$1.45 (domestic) or \$2.95 (foreign) a copy. □

Computer Symposium Planned

THE third annual Symposium on the Simulation of Computer Systems will be held at the National Bureau of Standards in Boulder, Colo., August 12-14, 1975.

The symposium, the only one devoted exclusively to the simulation of computer systems, is being sponsored by NBS and the Special Interest Group on Simulation (SIGSIM) of the Association for Computing Machinery (ACM).

The symposium is the only major forum for the exchange of ideas and techniques in the field of computer system simulation for those who are new to the field as well as those already established in it.

Technical papers at this year’s symposium will detail the latest developments for the manager and analyst with technical knowledge and experience in computer simulation. Papers will cover the areas of: Workload Definition, Minicomputers and Networks, Software Simulation, Computer Scheduling, Computer Simulation Languages and Packages, Computer System Design and Mathematical and Economic Models.

A tutorial program will also be

provided for attendees with an interest, but no prior background, in one or more aspects of the modeling and simulation process. Tutorial subjects include: Introduction to Computer System Simulation, Languages for Computer System Simulation, Computer System Simulation Packages, Terminal Emulation and Validation Criteria.

These formal technical sessions and tutorials will be augmented by informal discussion/workshop sessions on the topics of Computer System Simulation Packages, Simulation of Minicomputers, Techniques for Large Computer Centers and Data Collection, Analysis and Validation.

The symposium will conclude with a panel comprised of the session chairmen and tutorial and workshop participants. This forum will enable those people attending the symposium to interact with a group of established experts in the field.

Registration fees for the Symposium are: \$60 for NBS, ACM and SIGSIM members; \$75 for nonmembers; \$25 for students. For information contact John Caron, FEDSIM/NA, Washington, D.C. 20330. □

New Air Conditioners Save Energy, Money

OVER the next 7 years the Federal Government expects to save \$400,000 on the costs of 27,000 window air conditioners purchased between November 1, 1974 and October 31, 1975. Although these units cost 39 percent more to buy than comparable units purchased last year, they will use 21 percent less energy.

This purchase experiment was stimulated by the National Bureau of Standards' Experimental Technology Incentives Program (ETIP) through the Federal Supply Service (FSS) of the General Services Administration.

ETIP was begun in fiscal 1973 to find ways to stimulate technological change for the economic welfare of the Nation. By the end of this fiscal year ETIP will have committed \$10 million to cooperative projects with other government agencies and to policy studies.

The more efficient air conditioners were placed on the Federal Supply Service schedules as the first experiment in the use of Life Cycle Costing (LCC). In the past the GSA based its purchases upon the lowest bid price per unit. But LCC bases a potential procurement on both low initial cost and on ownership costs over the expected life span of the equipment.

Air conditioning manufacturers entered competitive bidding for the approximately \$6.5 million contract. This is the first of at least three successive annual procurements for air conditioners using LCC, insuring a continuity that should convince the manufacturers that GSA is serious about purchasing more energy efficient units.

Five different sizes of room air conditioners will be supplied to the government. (Sizes of the air conditioners range from 8.4 million joules

(8,000 BTU) to 10.5 million joules (10,000 BTU), suitable for a small office, to more than 24.2 million joules (23,000 BTU), suitable for cooling larger offices.)

More important, however, is the Energy Efficiency Ratio (EER). The energy efficiency ratios of the air conditioners range from 7.2 up to 9.9. The higher the EER number, the more efficient is the unit. The average of these energy efficiency ratios is 21 percent higher than the EER's of units ordered by the government last year.

Six manufacturers entered the bidding. Sharing this \$6.4 million procurement are two companies: General Electric received more than \$2.5 million of the award; Fedders Corporation received \$3.9 million. The Fedders contract is unique in another way. It is the first time that an air conditioner manufacturer has offered the government models suitable for the particular combination of humidity, temperature, and so forth in the region where the air conditioner will be used. □

Ethane Data Available

THE most accurate and comprehensive collection of provisional values for the thermodynamic functions of ethane has been completed by the National Bureau of Standards' Cryogenics Division, Boulder, Colo., and published as NBSIR 74-398.

Authored by R. D. Goodwin and titled "Provisional Values for the Thermodynamic Functions of Ethane," the 334-page publication tabulates the thermophysical properties at integral temperatures over the entire range of fluid states from 90 to 600 K along isobars to 700 bar. These tables provide the first of such information available for liquid ethane below its normal boiling point temperature (184.5 K).

A simplified and more highly constrained version of a novel NBS-developed equation of state used to define methane was applied to obtain

this publication's data.

Ethane is a colorless, odorless, gaseous hydrocarbon found in natural gas and used primarily as a fuel. The accurate knowledge of ethane values are essential for the processes of liquefaction, separation, storage, pumping, transportation and equitable trade of LNG (liquefied natural gas). Ethane data combined with the recently defined data for methane, the major component of natural gas, are assisting the overall adoption of LNG interim standards. They are also indispensable for reliability and safety in engineering plant design.

Copies of NBSIR 74-398 are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, Va. 22151, at \$9.50 per paper copy or \$2.25 per microfiche copy. Order by NTIS Accession #Com-75-10130. □

Standard for APT Programming Language

A new Federal Information Processing Standards (FIPS) task group is being formed to develop a Federal standard for the Automatically Programmed Tool (APT) programming language used to direct numerically controlled machines.

APT programs are processed by a computer which generates a tape containing the ordered set of instructions that drive the machine. The efforts by the Institute for Computer Sciences and Technology of the National Bureau of Standards to standardize APT will promote the efficient and economical interchange of computer programs for such machines throughout Federal production facilities. Presently, the Federal Government owns 2,400 numerically controlled machines valued at \$350 million.

The American National Standards Institute (ANSI) Committee on APT Standards (X3J7) is now revising the voluntary industry standard for APT. The NBS FIPS task group (TG-19) will consider the suitability of the ANSI standard for APT for use as a Federal standard.

On a continuing basis, the task group will identify and prepare recommended changes to APT language to keep it responsive to government users' needs. The task group will co-operate with and participate in voluntary industry standards efforts to develop and maintain a common standard for APT.

Numerically controlled machines are especially economical in manufacturing parts in small quantities. Use of these machines increases the accuracy of machine part production, reduces the cost of each part and increases productivity.

There are many instances when spare parts must be made for government equipment which is no longer in production. The standard program written for a particular part can be preserved for future use without any reprogramming expense or danger that the machine part will not meet specifications.

In the case of a national emergency, the use of a standard APT language will facilitate the rapid conversion from non-military to military production. □

GRAFFITI *continued*

tion, your graffiti problem can be reduced."

NBS identified and evaluated 19 organic coatings and found that many met specific requirements, although no one coating proved superior in all areas. Their varying properties make them adaptable to specific climates or geographical areas—for instance, some proved resistant to condensing water, while others did not.

Coatings were evaluated for their resistance to erosion, cracking and discoloration as well as for ease of graffiti removal. "We know the coatings are affected by weathering," said Godette, "but we're not sure how much they are affected." Despite any apparent disadvantages, the clear coatings are being used in many problem areas, including a school and a fast-food restaurant in Washington, D.C.

Unlike graffiti removers, many commercial coating substances have names that indicate their anti-graffiti purpose. Many others are called "sealers."

The NBS researchers found three coatings that resist most of the common types of markings. In addition, they found two others that are highly resistant to spray paint and four others that effectively resist crayon, felt-tip pen and lipstick.

The three products that best resist all common markings are generically classified as a urethane, a dimethyl silicone and a styrene acrylonitrile terpolymer.

"These coatings cost just slightly more than a coating of paint for the same surface area," said Godette, "and they can be useful in making any future graffiti defacement easier to clean up." □



MONITORING *continued*

high voltage (the input), the voltage between one end point and an intermediate point of the chain will be some fixed fraction of the input.

"Power factor" is a measure of the tendency for some of the energy in an alternating current circuit to become trapped in a part of the circuit (in the transmission line, say) surging back and forth until it is dissipated as heat. This heat does no one any good and adds to the cost of the energy. Reactors, suitably connected into the circuit, are used to reduce such losses to a negligible minimum. The kind of reactor employed depends on the nature of the load: the reactor is

capacitive if applied to inductive loads, such as motors; and it is inductive if applied to capacitive loads, such as long transmission lines.

At the consumers' end of the distribution system, voltages are normally stepped down to 110 or 220 volts by local transformers. NBS, through its Electrical Instruments Section, is also actively involved in assuring the accuracy of the low-voltage watt-hour meters that measure electrical energy at these low voltages and thereby determine the size of the millions of electric bills that go to consumers every month.

Field Service

Usually only three major pieces of apparatus are taken to a field calibration project: a current comparator bridge which High Voltage Measurements Section personnel developed, a hermetically sealed low-voltage standard capacitor for use at about 500 volts, and one or the other of two compressed-gas intermediate-voltage standard capacitors for operation at 20 kilovolts and 200 kilovolts, respectively.

In comparing utility company high-voltage capacitor standards with the two compressed-gas intermediate-NBS capacitors, using the current comparator bridge, accuracies of 0.005 percent can be obtained without too much trouble. In test reports on potential transformers, voltage ratios are given with uncertainties typically between 0.01 and 0.03 percent. The phase angle between input and output voltages is given to within 0.3 milliradians. In the case of shunt reactors, used to reduce the power factor in transmission lines, the important parameter is the power factor of the reactor itself, since this

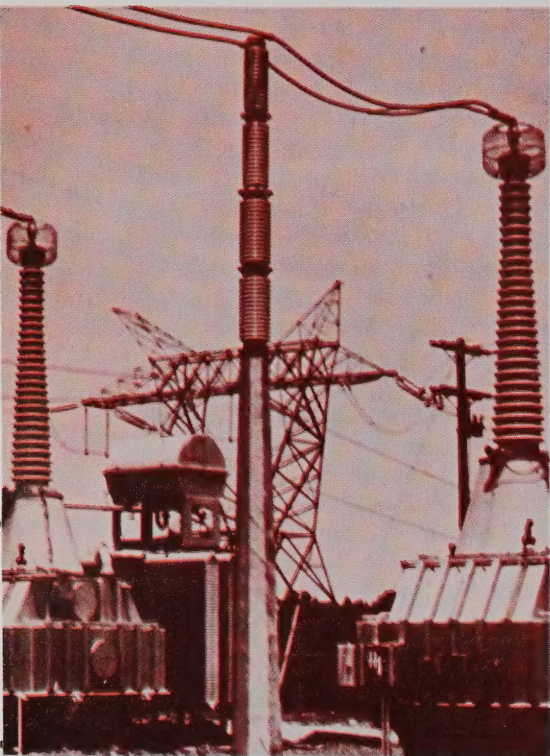
determines the heating losses within the reactor. Reactor power factors as small as 0.001 may be significant.

The field project equipment is easily transported in a van and is accompanied normally by two members of the NBS staff. Air transportation is used for trips beyond about 500 miles. Fees for the service are determined strictly on a cost basis, including such things as actual travel, per diem and working time, shipment of equipment, preparations, analysis of data and preparing reports.

Under Development

A significant complement to the high-voltage field service is expected to result from a project now underway in the High Voltage Measurements Section. This project, which is sponsored jointly by NBS and the Electric Power Research Institute (EPRI), is aimed at developing apparatus and procedures for on-site calibration of coupling capacitor voltage transformers (CCVT's) that are permanently installed for high-voltage energy metering at strategic points like electric power substations.

The main advantages of CCVT's, which account for their increasing popularity, are their greater ruggedness and smaller initial cost as compared with the fragile and expensive induction potential transformers. Their adoption has, however, been somewhat retarded because their characteristics are not as stable as those of the inductive transformers, and they therefore require more frequent calibrations. This obstacle should be overcome when a suitable field calibration system is available. To develop such a system and make it generally available is the purpose of the CCVT project. □



The inductors shown above represent one of the several kinds of equipment involved in the monitoring of high voltage power.

of the National Bureau of Standards

Baxendale, J. H., and Wardman, P., *The Radiolysis of Methanol: Product Yields, Rate Constants, and Spectroscopic Parameters of Intermediates*, Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 54, 26 pages (Apr. 1975) SD Catalog No. C13.48:54, 85 cents.

Sushinsky, G. F., and Mathey, R. G., *Fatigue Tests of Bituminous Membrane Roofing Specimens*, Nat. Bur. Stand. (U.S.), Tech. Note 863, 32 pages (Apr. 1975) SD Catalog No. C13.46:863, \$1.15).

Dei Rossi, J. A., *Cost Recovery in Pricing and Capacity Decisions for Automated Information Systems*, Nat. Bur. Stand. (U.S.), Tech. Note 864, 60 pages (Apr. 1975) SD Catalog No. C13.46:864, \$1.20.

Parrish, W. R., Voth, R. O., Hust, J. G., Flynn, T. M., Sindt, C. F., and Olien, N. A., and Hord, J., Ed., *Selected Topics on Hydrogen Fluoride*, Nat. Bur. Stand. (U.S.), Spec. Publ. 419, 212 pages (May 1975) SD Catalog No. C13.10:419. \$2.80.

Peavy, B. A., Burch, D. M., Powell, F. J., and Hunt, C. M., *Comparison of Measured and Computer-Predicted Thermal Perform-*

ance of a Four Bedroom Wood-Frame Townhouse, Nat. Bur. Stand. (U.S.), Bldg. Sci. Ser. 57, 62 pages (Apr. 1975) SD Catalog No. C13.29/2:57, \$1.20.

Chaconas, G. S., *Latex Foam Mattresses for Hospitals*, (ANS Z 255.1-1975), Nat. Bur. Stand. (U.S.), Prod. Stand. 63-75, 8 pages (Apr. 1975) SD Catalog No. C13.20/2:63-75, 50 cents.

Page, C. H., and Vigoureux, P., Eds., *International Bureau of Weights and Measures 1875-1975*, Nat. Bur. Stand. (U.S.), Spec. Publ. 420, 257 pages (May 1975) SD Catalog No. C13.10:420. \$3.00.

Richman, P., Ed., *Critical Electrical Measurement Needs and Standards for Modern Electronic Instrumentation*, Nat. Bur. Stand. (U.S.), Tech. Note 865, 74 pages (May 1975)
SD Catalog No. C13.44:147, \$2.15.

Danos, M., and Gillet, V., *Relativistic Many-Body Bound Systems*, Nat. Bur. Stand.

(U.S.), Monogr. 147, 149 pages (Apr. 1975)
SD Catalog No. C13.44:147, \$2.15.

Ives, L. K., Harper, A., and Ruff, A. W., *Application of Ion Beam Milling to the Characterization of Cracks in Metals*, Nat. Bur. Stand. (U.S.), Tech. Note 862, 29 pages (Apr. 1975) SD Catalog No. C13.46:862, 80 cents.

Anbar, M., Farhataziz, and Ross, A. B., *Selected Specific Rates of Reactions of Transients from Water in Aqueous Solution, II. Hydrogen Atom*, Nat. Stand. Ref. Data Ser., Nat. Bur. Stand. (U.S.), 51, 56 pages (May 1975) SD Catalog No. C13.48:51, \$1.20.

Publications listed here may be purchased at the listed price from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (foreign: add 25%). Microfiche copies are available from the National Technical Information Service, Springfield, Va. 22151. For more complete periodic listings of all scientific papers and articles produced by NBS staff, write: Editor, Publications Newsletter, Administration Building, National Bureau of Standards, Washington, D.C. 20234.

ENTER MY SUBSCRIPTION TO DIMENSIONS/NBS (formerly the NBS Technical News Bulletin) (C13.13) at \$9.45. Add \$2.40 for foreign mailing. No additional postage is required for mailing within the United States or its possessions.

Send subscription to:

NAME—FIRST LAST

[illegible]

COMPANY NAME OR ADDITIONAL ADDRESS LINE

[illegible]

STREET ADDRESS

[illegible]

CITY

[illegible]

STATE

--	--

ZIP CODE

--	--	--	--	--

PLEASE PRINT

☐ Remittance enclosed
(Make checks payable to
Superintendent of
Documents)

☐ Charge to my Deposit
Account No. _____

MAIL ORDER FORM TO:

**Superintendent
of Documents
Government Printing
Office
Washington, D.C. 20402**

AN EQUAL OPPORTUNITY EMPLOYER

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington D.C. 20234

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
COM-215

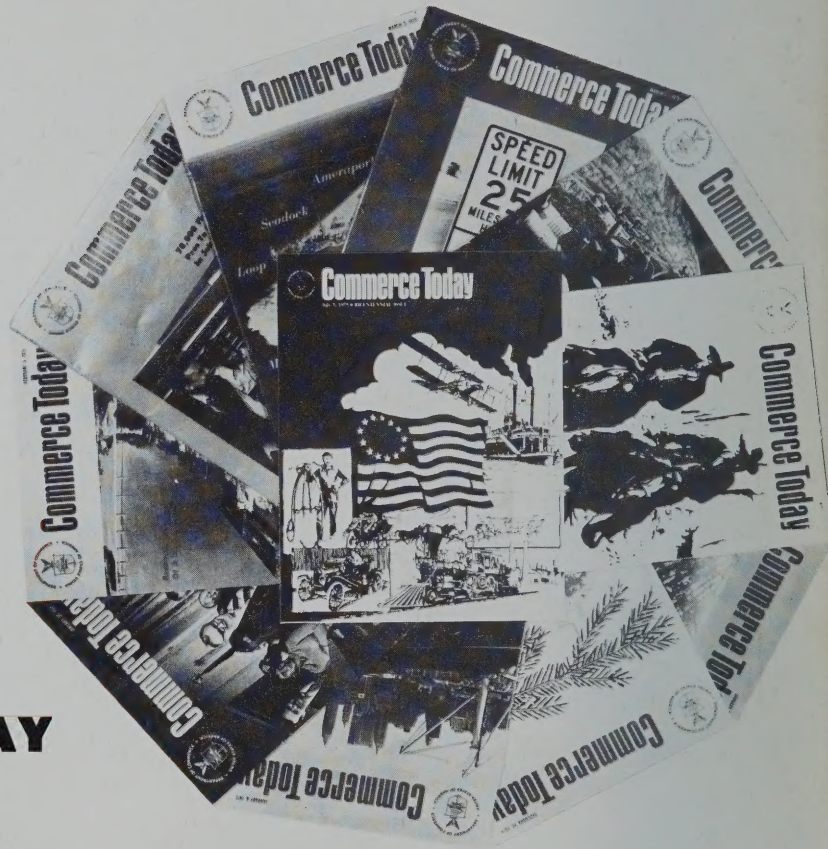


OFFICIAL BUSINESS
Penalty for Private Use, \$300
RETURN POSTAGE GUARANTEED

THIRD CLASS MAIL

What's Commerce Done For You Lately?

**Subscribe to
COMMERCE TODAY
... and find out**



This information-packed biweekly magazine of the U.S. Department of Commerce gives you the facts from the experts on the economy, domestic and international business, energy management, and a variety of other subjects of vital concern to the business executive.

Send your check or money order for \$29.80 to the Government Printing Office for a one-year subscription to **Commerce Today.**

MAIL ORDER TO:
Superintendent of Documents
Government Printing Office
Washington, D.C. 20402